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THE Be-Np (BERYLLIUM-NEPTUNIUM) SYSTEM

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The Be-Np (Beryllium-Neptunium) System

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Equilibrium Diagram

The melting point of β Be and the β Be \rightarrow α Be allotropic transformation temperature are 1289 ± 4 and 1270 ± 6 °C, respectively [86BAP]. The melting point of γ Np and the γ Np \rightarrow β Np \rightarrow α Np allotropic transformation temperatures are 639, 576, and 280 °C, respectively [85War].

An X-ray diffraction study of [54Run] showed that only one intermediate phase, Be_{13}Np , exists in the Be-Np system. Be_{13}Np did not melt on heating to 1400 °C [54Run]. This phase was considered to have some homogeneity range because the lattice parameter varied in samples of different composition [54Run].

Crystal Structures

The crystal structure and lattice parameter data are given in Table 1. The structure of Be_{13}Np is isomorphous to NaZn_{13} [54Run]. The observed contraction of Be_{13}Np on the Np-rich side may be due to formation of a Be defect structure [54Run].

Cited References

- *54Run: O.J.C. Runnalls, "The Intermetallic Phase NpBe_{13} ", Acta Crystallogr., **7**, 222-223 (1954). (Equi Diagram, Crys Structure; Experimental)
- 84Ste: G.R. Stewart, Z. Fisk, J.L. Smith, J.O. Willis, and M.S. Wire, "New Heavy-Fermion System, NpBe_{13} , with a Comparison to UBe_{13} and PuBe_{13} ", Phys. Rev. B, **30**(3), 1249-1252 (1984). (Crys Structure; Experimental)
- 85War: J.W. Ward, P.D. Kleinschmidt, and D.E. Peterson, "Thermochemical Properties of the Actinide Elements and Selected Actinide-Noble Metal Intermetallics," Handbook of the Physics and Chemistry of the Actinides, (ed.) C. Keller and A. Freeman, North-Holland, Amsterdam (1985). (Equi Diagram; Review)
- 86BAP: to be published in Bull. Alloy Phase Diagrams, (1986). (Equi Diagram; Compilation)

* Indicates key paper.

General References

- [King1]: H.W. King, "Crystal Structures of the Elements at 25 °C", Bull. Alloy Phase Diagrams, 2(3), 401-402 (1981)
- [King2]: H.W. King, "Temperature-Dependent Allotropic Structures of the Elements", Bull. Alloy Phase Diagrams, 3(2), 275-276 (1982)

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Table 1 Be-Np Crystal Structure and Lattice Parameter Data

Phase	Composition, at.% Np	Struktur-		Space group	Proto- type	Lattice parameters, nm			Reference
		Pearson symbol	bericht designation			a	b	c	
(β Be).....	0	cI2	A2	Im3m	W	0.25515	...	...	[King2]
(α Be).....	0	hP2	A3	P6 ₃ /mmc	Mg	0.22857	...	0.35839	[King1]
Be ₁₃ Np...~7.14	(a)	cF112	D2 ₃	Fm3c	NaZn ₁₃	1.0266	...	...	[54Run]
	(b)					1.0256	...	...
	7.14					1.0267	...	...	[84Ste]
(rNp)...	100	cI2	A2	Im3m	W	0.352	...	...	[King2]
(β Np)...	100	tP4	A _d	P42 ₁ 2	β Np	0.4896	...	0.3387	[King2]
(α Np)...	100	oP8	A _c	Fmma	α Np	0.6663	0.4723	0.4887	[King1]

(a) Be-rich. (b) Np-rich.